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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/592,913	11/13/2006	Wendelin Jan Stark	0796-76794/DSD	5717

7590  
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05/20/2009

EXAMINER
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AHVAZI, BIJAN

ART UNIT	PAPER NUMBER
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1796

MAIL DATE	DELIVERY MODE
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05/20/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/592,913	<b>Applicant(s)</b> STARK ET AL.	
	<b>Examiner</b> Bijan Ahvazi	<b>Art Unit</b> 1796	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 February 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 25-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 September 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The listing of references in the specification (pages 8 and 9) is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 2-8, 21 and 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the production" in the first line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 2 recites the limitation "the mean carbon value" in the first line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 3 recites the limitation "the viscosity reducing solvent" in the first line of the claim. There is insufficient antecedent basis for this limitation in the claim. Dependent claim 7 is rendered indefinite as a result.

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Claim 4 recites the limitation that "the metal carboxylate ... has a viscosity of atmost 100 mPas." The viscosity of a solution is strongly dependent on the temperature, and thus a viscosity measurement is meaningless without specifying the temperature at which the measurement was taken. Furthermore, the wording of claim 4 makes it appear as if the viscosity of a salt (the metal carboxylate) is being claimed, instead of a solution thereof as is believed to be the intended limitation. All dependent claims are rendered indefinite as a result.

Claim 16 recites " $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH}) 2x^F 2y (\text{CO}_3)_z$ " wherein F is not properly define. Further clarification is respectfully requested.

Claim 21 recites the limitation "the enthalpy" in the second line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 23 recites the limitation "the formation" in the third line of the claim. There is insufficient antecedent basis for this limitation in the claim.

### ***Double Patenting***

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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5. Claims 1-24 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-19 of copending Application No. (US 10/557,339), in view of Fujii *et al.* (Pat. No. US 4,659,617). Although the preambles are different, and the conflicting claims are not identical; they are not patentably distinct from each other because the present claims indicated above also cover compositions which overlap with the claims of the copending applications above, and thus, render the present claims ***prima facie*** obvious. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the method for production of a metal oxide by Stark *et al.* (copending Application No. US 10/557,339), and the metal carboxylate prior to being formed into droplets which has a specific viscosity and the solvent is free of acid with a fibrous product of apatite as taught by Fujii *et al.* in order to find precursors for flame spray synthesis of oxide and metal nanoparticles that combine low viscosity and high metal concentration. Furthermore, such formulations should be readily produced and be stable upon storage. Therefore it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to arrive at the same inventive composition because the disclosure of the inventive subject matter appears within generic disclosure with the combination of the prior art as taught by Fujii *et al.* (Col. 4, lines 51-64).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### ***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. Claims 1, 2, 3, 6, 9, 18, 19, 20 and 21 are rejected under 35 U.S.C. 102(a) as being anticipated by Stark *et al.* (Pub. No. US 2004/0126298 A1). .

Regarding claims 1, 2, 3, 6 and 20, Stark *et al.* disclose a method for the production of a metal oxide, wherein at least one metal oxide precursor is dissolved in a high enthalpy carboxylic acid solvent comprising at least one carboxylic acid with a mean carbon content of >2 carbon atoms in an amount of at least 60% of the whole solvent to form a solution (Page 2, ¶0015) and wherein said solution is then formed into droplets and flame oxidized (Page 2, ¶0035). The salt may also be produced within the solvent mixture in situ, meaning that a suitable salt precursor (namely a metal comprising compound, e.g. an oxide, a carbonate or a pure metal, that reacts with at least one of the components of the solvent to form a solution) is brought into the solvent mixture where it then forms the salt or derivative of the solvent (e. g. a carboxylic acid salt of a carboxylic acid from the solvent) (Pages 3 & 4, ¶0044) wherein the carboxylic acid content is at least 75%, preferably at least 90%, more preferably about 100% (Page 3, ¶0039; Page 7, Claim 2).

Regarding claim 9, Stark *et al.* disclose that the carboxylic acid is selected from C1 to C18 monocarboxylic acids and mixtures thereof (Page 3, ¶0040; Page 7, Claim 4).

Regarding claims 18, 19, Stark *et al.* also disclose that current methods for the production of metal oxides such as ceria and ceria/zirconia are mechanical and mechanical/thermal processes, wet-phase chemistry based methods, and high temperature methods such as flame spray pyrolysis (FSP) (Page 1, ¶0005), wherein the metal oxides, in

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particular mixed metal oxides (Page 4, ¶0052) have at least one very good particle size stability after heating (e.g. 700 °C., 16 hours in air, or 900 °C., 2 h, air) (Page 4, ¶0056).

Regarding claims 21, Stark *et al.* disclose that current method, wherein the solvent has an enthalpy of at least 15 kJ/g, preferably at least 20 kJ/g, more preferably at least 23 kJ/g, e.g. at least about 23.7 kJ/g (Page 3, ¶0039; Page 7, Claim 7).

Since Stark *et al.* teach the method for production of metal salts as the recited claimed, the method of the production of a metal oxide would inherently possess the recited limitation because same ingredients and condition are utilized. Stark *et al.* teach all the limitations of the instant claims. Therefore claims 1, 2, 3, 6, 9, 18, 19, 20 are as being anticipated by Stark *et al.*

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 4, 5, 7, 8, 10, 11, 12-13, 14 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark *et al.* (Pub. No. US 2004/0126298 A1) as applied to claim 1, 2, 3, 6, 9, 18, 19, 20, 21 above, and further in view of Stark *et al.* (Pub. No. US 2006/0229197 A1).

Regarding claims 4, 5, 7, 8, Stark *et al.* ("298") discussed all the features as above. However Stark *et al.* ("298") do not expressly disclose that the recited method for production of a metal oxide wherein the metal carboxylate prior to being formed into droplets has a viscosity of at most 100 mPas and the solvent is free of acid.

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Stark *et al.* ("197") disclose the method, preferably at most 40 mPas, wherein the enthalpy of the metal carboxylate at least 13 kJ/g and the oxidation is performed at a temperature of at least 600 °C (Page 3, ¶0038; Page 8, Claims 4, 12 14). Stark *et al.* ("197") also disclose wherein the viscosity is obtained by heating and/or by providing a mix of the at least one metal carboxylate (the anion source is disclosed in Stark *et al.* ("298")) and at least one viscosity reducing solvent (Page 8, Claim 5) wherein the solvent is free of acid (Page 8, Claims 7). The solvent comprises at least one low molecular weight and/or low viscosity apolar solvent selected from the group consisting of toluene, xylene, lower aliphatic hydrocarbons and mixtures thereof (Page 3, ¶0040; Page 8, Claim 8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the method for production of a metal oxide by Stark *et al.* ("298") with the metal carboxylate prior to being formed into droplets which has a specific viscosity and the solvent is free of acid as taught by Stark *et al.* ("197") in order to avoid any huge solvent costs, production of unwanted large amounts of waste water and need calcination steps after the synthesis, making them cost intensive and further provide increased homogeneity of the product.

Regarding claims 10, 11, 12-13 and 14, Stark *et al.* ("298") disclose the metal oxide such as ceria/zirconia, with the zirconium being present in at most 90 atom%, preferably at most 80 atom% of total metal atoms. However Stark *et al.* ("298") do not expressly disclose that the recited metal oxide is calcium and at least one further metal selected from the group consisting of magnesium, zinc, strontium, barium, rare earth metals, and mixtures of two or more of the above-mentioned metals.

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Stark *et al.* ("197") disclose the method, wherein the metal or the combination of metals is selected from the group consisting of any rare earth metal such as magnesium, calcium, strontium (Page 5, ¶0058, Page 8, Claim 10), wherein the metal carboxylate is prepared starting from a metal oxide, a metal hydroxide, a metal carbonate, a metal halide or a metal lower alkyl oxide (Page 8, Claim 13). Stark *et al.* ("197") also disclose the metal carboxylates comprise impurities of one or more elements of the group comprising alkali metals, alkaline earth metals, transition metals, rare earth metals, chlorides, fluorides, bromides, phosphates, sulfates, silicon, and main group metals, whereby the impurities are present in amounts in the range of 0.5 to 5% by weight (read on 0.05 moles per liter, Page 8, Claim 15) and wherein the burner comprises nozzles and the solution comprises at least 0.15 moles metal per liter, leading to production rates of at least 0.15 moles metal or metal oxide per nozzle (Page 8, Claim 16). The examiner notes that the substitution of equivalents (i.e. metal ) requires no express motivation as long as the prior art such as Stark *et al.* ("197") recognizes the equivalency (Page 5, ¶0058, Page 8, Claim 10). *In re Fount* USPQ 532 (CCPA 1982); *In re Siebentritt*, 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v Linde Air Products Co.*, 85 USPQ 328 (USSC).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the method for production of a metal oxide by Stark *et al.* ("298") with the metal combination (i.e. interchangeable metal) as taught by Stark *et al.* ("197") in order to avoid any huge solvent costs, production of unwanted large amounts of waste water and need calcination steps after the synthesis, making them cost intensive and further provide increased homogeneity of the product.

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10. Claims 15, 16, 17 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark *et al.* (Pub. No. US 2004/0126298 A1) and Stark *et al.* (Pub. No. US 2006/0229197 A1) as applied to claim 1-14, 18-21 above, and further in view of Fujii *et al.* (Pat. No. US 4,659,617).

Regarding claims 15-17, 23-24, Stark *et al.* ("298") and Stark *et al.* ("197") discussed all the features as above. Moreover, Stark *et al.* ("298") disclose a metal oxide that is obtainable by the recited method (Page 8, Claim 12), wherein a metal oxide has a dynamic oxygen storage capacity after heat treatment at 700 °C for 16 hours in air of at least 1.5 liters O<sub>2</sub> per kg catalyst (Page 8, Claim 18). However, Stark *et al.* ("298") do not expressly disclose wherein the metal salt is produced in a flame with insufficient oxygen for full combustion or conversion of the reactants resulting in the formation of substoichiometric salts and further wherein the metal salt is selected from the group consisting of amorphous tricalciumphosphate derivative, apatites and mixtures thereof.

Stark *et al.* ("197") disclose that the metal oxide is produced in a flame with insufficient oxygen for full conversion resulting in the formation of substoichiometric oxides or metals and mixtures thereof (Page 8, Claim 7), and further wherein the as-produced metal oxide is converted to the corresponding non oxides by means of an additional treatment (Page 9, Claim 18).

Neither Stark *et al.* ("298") nor Stark *et al.* ("197") disclose wherein the metal salt is selected from the group consisting of amorphous tricalciumphosphate derivative, apatites and mixtures thereof. Fujii *et al.* disclose a fibrous product of apatite comprising one or more apatites selected from a group of apatites represented by the general formula:  $M_{10} (ZO_4)_6 X_2$  wherein M represents Ca, Ba, Mg, Sr, Pb, Cd, Fe and the like, ZO<sub>4</sub> represents PO<sub>4</sub>, AsO<sub>4</sub>, VO<sub>4</sub>, CO<sub>3</sub> and the like, and X represents F, Cl, OH and the like (Col. 4, lines 51-64).

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the method for production of a metal oxide by Stark *et al.* ("298") and the metal carboxylate prior to being formed into droplets which has a specific viscosity and the solvent is free of acid by Stark *et al.* ("197") with a fibrous product of apatite as taught by Fujii *et al.* in order to find precursors for flame spray synthesis of oxide and metal nanoparticles that combine low viscosity and high metal concentration. Furthermore, such formulations should be readily produced and be stable upon storage.

11. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark *et al.* (Pub. No. US 2004/0126298 A1) in view of Stark *et al.* (Pub. No. US 2006/0229197 A1), and further in view of Fujii *et al.* (Pat. No. US 4,659,617).

Regarding claims 1-14, 18-24, Stark *et al.* ("298") and Stark *et al.* ("197") discussed all the features as above. However, Stark *et al.* ("298") and Stark *et al.* ("197") do not expressly disclose wherein the metal salt is selected from the group consisting of amorphous tricalciumphosphate derivative, apatites and mixtures thereof. Fujii *et al.* disclose a fibrous product of apatite comprising one or more apatites selected from a group of apatites represented by the general formula:  $M_{10} (ZO_4)_6 X_2$  wherein M represents Ca, Ba, Mg, Sr, Pb, Cd, Fe and the like,  $ZO_4$  represents  $PO_4$ ,  $AsO_4$ ,  $VO_4$ ,  $CO_3$  and the like, and X represents F, Cl, OH and the like (Col. 4, lines 51-64) corresponding to the instant applicants' limitation claims 15-17.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the method for production of a metal oxide by Stark *et al.* ("298") and the metal carboxylate prior to being formed into droplets which has a specific viscosity and the

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solvent is free of acid by Stark *et al.* ("197") with a fibrous product of apatite as taught by Fujii *et al.* in order to find precursors for flame spray synthesis of oxide and metal nanoparticles that combine low viscosity and high metal concentration. Furthermore, such formulations should be readily produced and be stable upon storage.

### ***Response to Arguments***

12. Applicant's election of Group I, claims 1-24, with traverse in the reply filed on 02/04/2009 is acknowledged. Traversal is on the grounds it is believed restriction is inappropriate for several reasons. The applicant argues that the Office Action asserts that the common technical feature between Group I and Group II are metal salts. The Office Action by Examiner H. Nguyen points to U.S. Patent 4,855,118 to Ichinose *et al.* as showing a process for manufacturing nanoparticulate fluoroapatite. The Office Action concludes that the common technical feature between Group I and Group II is not a special technical feature, and thus the Groups lack unity. Applicant argues that the present process relates to a water-free process (e.g., see claim 1: oxidizing in a high temperature environment), where the thus obtained metal salts are water-free. In contrast, Ichinose *et al.* relates to the manufacture of metal salts using a wet process (e.g., see claim 1, step (c) of Ichinose *et al.* Accordingly, the special technical feature linking Group I and Group II may be seen in nanoparticulate metal salts which are water-free. Such metal salts are not taught or suggested by Ichinose *et al.*

This is found persuasive by new examiner Bijan Ahvazi. However, the applicant's argument with respect to restriction is appropriate and moot in view of Stark *et al.* (Pub. No. US 2004/0126298) reference under 35 U.S.C. 102(a). The requirement is still deemed proper and is therefore made **FINAL**.

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***Examiner Information***

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bijan Ahvazi, Ph.D. whose telephone number is (571)270-3449. The examiner can normally be reached on M-F 8:0-5:0. (Off every other Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Y. Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BA/  
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05/7/2009